

IN THE SPECIFICATION:

Paragraph beginning at line 3 of page 1 has been amended as follows:

The present invention relates to a step motor control device that rotationally drives a step motor and detects the presence/absence of the rotation of the step motor, and to an electronic timepiece ~~that uses~~ utilizing the step motor control device.

Paragraph beginning at line 8 of page 1 has been amended as follows:

~~Up to now, in the~~ In an electronic timepiece, a step motor is used as a motor that rotationally drives time hands such as an hour hand or a minute hand.

Paragraph beginning at line 11 of page 1 has been amended as follows:

Fig. 5 is a front view showing a step motor used in ~~the~~ such electronic timepiece ~~such as a~~ having an hour hand or a minute hand and described in JP57-18440 B (pgs. 1-2, Fig. 1) (hereinafter "Patent Document 1") ~~up to now (for example, refer to patent Document 1).~~

Paragraph beginning at line 9 of page 2 has been amended as follows:

Fig. 6 is a circuit diagram showing a conventional step motor control device for conducting the rotation control of the step motor, ~~which has been used in the electronic timepiece up to now.~~ The circuit is structured such that a rotation drive circuit and a rotation detecting circuit are integrated together (for example, refer to Patent Document 1).

Heading at line 1 of page 6 has been deleted as follows:

~~{Patent Document 1}~~

Heading at line 2 of page 6 has been deleted as follows:

~~JP 57-18440 B (pages 1 to 2, Fig. 1)~~

Paragraph beginning at line 19 of page 6 has been amended as follows:

Accordingly, even ~~through~~ though the step motor does not rotate, because the counterclockwise vibration of the rotor 502 is large within a given period immediately after the supply of the drive pulse P1 is finished, the detection voltage V7 that exceeds the threshold voltage Vss may be obtained as shown in Fig. 7. That is, in the detection signal V7 that is obtained in a given period T7 immediately after the

supply of the drive pulse P1 is finished, a detection voltage having a large peak value is generated in the detection resistor 209 due to the large free vibration of the rotor 502 and misdetection is caused that the step motor is rotating.

Paragraph beginning at line 5 of page 7 has been amended as follows:

Up to now, in order to prevent such misdetection, the control circuit ~~is~~ has been structured such that a non-detection period IT having a given time width T7 is set immediately after the supply of the drive pulse is stopped, thereby preventing detection of the rotation of the step motor in the non-detection period IT. Accordingly, there arises such a problem that the structure of the control circuit is complicated because of the provision of the non-detection period IT.

Paragraph beginning at line 22 of page 7 has been amended as follows:

According to the present invention, there is provided a step motor control device including: first and second switch elements which are connected to each other in series; third and fourth switch elements which are connected to each other in series; a coil of a step motor which is

connected between a node of the first and second switch elements and a node of the third and fourth switch elements; a first series circuit including a fifth switch element connected in parallel with the first switch element and a first detection element; a second series circuit including a sixth switch element connected in parallel with the third switch element and a second detection element; a control means ~~that controls~~ for controlling an on/off operation of the first to fourth switch elements in response to a drive pulse to allow a current to flow in the coil to rotationally drive the step motor, and ~~controls~~ controlling an on/off operation of the fourth, third, fifth, and sixth switch elements in response to a rotation detection control pulse that is supplied immediately after the supply of the drive pulse is finished in a rotation detection period immediately after the rotation drive of the step motor in accordance with the drive pulse; and a detecting means ~~that detects~~ for detecting the presence/absence of the rotation of the step motor on the basis of a comparison result of a voltage generated between the first and second detection elements and the coil with a given threshold voltage, ~~the device being characterized in that:~~

Paragraph beginning at line 22 of page 8 has been amended as follows:

~~in~~ According to one aspect of the present invention,
in the case where the step motor is rotationally driven by turning on the first and fourth switch elements in accordance with the drive pulse, the control means renders the fourth and fifth switch elements on and controls the on/off operation of the third switch element at a given frequency in a first given period immediately after the supply of the drive pulse is finished, and renders the third switch element and the sixth switch element on and control the on/off operation of the fourth switch element at a given frequency in a second given period after laps of the first given ~~period;~~ period.

Paragraph beginning at line 7 of page 9 has been amended as follows:

~~in~~ According to another aspect of the present invention, in the case where the step motor is rotationally driven by turning the second and third switch elements on in accordance with the drive pulse, the control means renders the third and sixth switch elements on and controls the on/off operation of the fourth switch element at a given period immediately after the supply of the drive pulse is finished, and renders the fourth switch element and the fifth switch

element on in the second given period and controls the on/off operation of the third switch element at a given ~~frequency,~~ and frequency.

Paragraph beginning at line 16 of page 9 has been amended as follows:

According to another aspect of the present invention, the detection means detects the presence/absence of the rotation of the step motor on the basis of the comparison result of the voltage generated between the first detection element and the coil with the threshold voltage when the fifth switch element is turned on, and detects the presence/absence of the rotation of the step motor on the basis of the comparison result of the voltage generated between the second detection element and the coil with the threshold voltage when the sixth switch element is turned on.

Paragraph beginning at line 24 of page 9 has been amended as follows:

In the case where the step motor is rotationally driven by turning on the first and fourth switch elements in accordance with the drive pulse, the control means renders the fourth and fifth switch elements on and controls the on/off operation of the third switch element at a given frequency in

a first given period immediately after the supply of the drive pulse is finished, and renders the third switch element and the sixth switch element on and controls the on/off operation of the fourth switch element at a given frequency in a second given period after lapse of the first given ~~period~~, period. ~~and in~~ In the case where the step motor is rotationally driven by turning the second and third switch elements on in accordance with the drive pulse, the control means renders the third and sixth switch elements on and controls the on/off operation of the fourth switch element at a given frequency in the first given period immediately after the supply of the drive pulse is finished, and renders the fourth switch element and the fifth switch element on and controls the on/off operation of the third switch element at the given frequency in the second given period. The detection means detects the presence/absence of the rotation of the step motor on the basis of the comparison result of the voltage generated between the first detection element and the coil with the threshold voltage when the fifth switch element is in an on state, and the detection means detects the presence/absence of the rotation of the step motor on the basis of the comparison result of the voltage generated between the second detection element and the coil with the threshold voltage when the sixth switch element is in an on state.

Paragraph beginning at line 7 of page 11 has been amended as follows:

Further, according to the present invention, there is provided an electronic timepiece including a step motor that rotates time hands and a step motor control device that rotationally controls the step motor, the timepiece being characterized in that any of the step motor control ~~device~~ devices described above is used as the step motor control device.

Heading at line 13 of page 11 has been amended as follows:

BRIEF DESCRIPTION OF THE ~~SEVERAL VIEWS OF THE~~
DRAWINGS

Paragraph beginning at line 23 of page 13 has been amended as follows:

~~Also, the~~ The control circuit 103 supplies to the rotation detection circuit 106 a rotation detection control pulse necessary ~~in~~ for executing the rotation detection of the motor 105. In this example, the control circuit 103 structures a rotation detection control pulse generating means that generates means that generates the rotation detection control pulse.

Paragraph beginning at line 9 of page 15 has been amended as follows:

Hereinafter, the operation of the step motor control device and the electronic timepiece in accordance with the embodiment of the present invention will be described with reference to Figs. 1 to 4 ~~properly referring to~~ and Figs. 5 and 8.

Paragraph beginning at line 8 of page 19 has been amended as follows:

In this manner, according to the step motor control device of this embodiment, it is possible to suppress a possibility of misjudging that the motor is rotated, in the case where the motor is not rotated, with a simple structure without providing the non-detection period IT, and it is possible to more surely detect the rotation of the step motor.